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ABSTRACT Over the past few decades environmental awareness and education have increased without a corresponding increase in pro-environmental behavior. Recent research on public service announcements and social marketing theory indicate that positive injunctive with positive descriptive norms are most effective in increasing pro-environmental behavior. The current study focused on the impact of different types of environmental messages on promoting recycling behavior in college students. Over 250 recycling actions were measured in the experiment. It was hypothesized that the positive injunctive with positive descriptive statement would be most effective in causing more university students to recycle. The findings, although not statistically significant, suggest that an educational based statement may be more effective on behavior than an emotional statement. One strength of this study is the ability to measure behavior directly and compare it to students' behavioral intentions.

INTRODUCTION

Human impact on and interactions with the environment have caused concern with the sustainability of the way we are living. Over the past few decades awareness and education of human impact has increased. Although it would seem that an increase in awareness would stimulate a corresponding increase in pro-environmental behavior, there has not been a large change in actions in support of the environment. Review studies that have made efforts to understand the gap between environmental awareness and ecological behavior have shown that knowledge and values explain very little about pro-environmental behavior (Kollmuss & Agyeman 2002). In addition, skeptics of anthropogenic impacts on the environment still exist. Environmental sustainability, which can be defined as the ability to live in harmony with earth without the destruction of natural resources, is driven by human attitudes and behaviors. Without knowledge of what affects attitudes and behaviors towards the environment grand scale changes in human actions are far less likely.

Measures such as the connectedness to nature scale (CNS, Mayer & Frantz 2004), the new environmental paradigm scale (NEP, Dunlap et al. 2000), the implicit associations test (IAT, Greenwald et al. 1998), and the inclusion of nature in the self scale (INS, Schultz 2001) have been created as tools to measure environmental attitude and evaluate its relationship to behavior. These tools quantify how close to nature a person is by using cognitive (knowledge based) and/or affective (feelings based) questions. All of these measures are important to gauge impacts of different bonds created between humans and the environment.

Public service announcements (PSAs) have the potential to create social change in environmental action. A

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PSA is a message broadcast to the public with the intention of raising awareness or creating social change in regards to a problem. Cialdini (2003) completed research concerning two main aspects of PSAs involving injunctive and descriptive norms. Injunctive norms indicate attitudes about a behavior that have a positive or negative reputation associated with them and descriptive norms indicate attitudes about a behavior that is commonly carried out by a certain population. Cialdini (2003) found that instead of having the norms compete with one another in a statement, it is best to have both of them work together to create change. That is, using injunctive and descriptive norms together can form the greatest change in behavior. In addition, the content of the message is also important. Factual data, feelings, and actions can have an impact on the targeted audience. It is how the norms, whether based on emotion or fact, work together to produce a PSA that is most effective in altering behavior.

Given the gap between attitudes and behavior the dilemma still remains as to which combination of messages most effectively alter behavior to promote pro-environmental action. Most studies have examined the relationship between environmental values and behavioral intention, but very few have directly measured pro-environmental behavioral actions. A relatively easy pro-environmental behavior to participate in and measure directly is recycling. Recyclables are a large portion of today's municipal solid waste, which are discarded by households, corporations, and schools. According to the U.S. Environmental Protection Agency, "Between 1960 and 2010 the amount of waste each person creates increased from 2.7 to 4.4 pounds per day. This results in about 250 million tons of waste generated in the US in 2010" (EPA 2011). With millions of students eating at school cafeterias worldwide, lunchrooms are major suppliers of the recyclables that get dumped in landfills each year. If all of the recyclables that are used in school cafeterias were recycled, the amount of solid waste that accumulates in landfills would decrease.

The current study was designed to analyze which type or combination of environmental message(s) would be most effective in increasing recycling behavior of university students. A weakness of many prior studies is that behavioral intention is used as a proxy for environmental behavior. The current study measures actual behavior by collecting and quantifying the number of recyclables for each type of message. It was hypothesized that the positive injunctive and descriptive norms would have the largest positive effect on students. The study also tested the hypothesis that students know what types of messages are most effective in supporting pro-environmental behavior as well as the hypothesis that any type of message would result in a higher participation of recycling in comparison to the control.

METHODS

At DePaul University in Chicago, Illinois a preliminary survey was administered to over 140 college students, primarily students majoring in environmental science and studies. Multiple DePaul University professors administered these surveys in the first or last five minutes of their class. This survey included seven messages using injunctive, descriptive, and/or educational statements. Students were asked to rank the messages in order of most effective at causing environmental behavior to least effective. From this survey four of the seven messages were selected to be used in the field study observing the effect of environmental messages on recycling behavior. The follow up field study was conducted at the Lincoln Park Student Center at DePaul University inside the inner dining hall which has three waste receptacle stations that include recycling bins. Every Wednesday at 12:00 pm signs containing messages to encourage recycling as a pro-environmental behavior were positioned next to two of the existing recycling bins. The third waste receptacle acted as a control throughout the study. Initial placement of signs was randomly determined. At 4:00 pm on the same day the recyclables were collected and counted and the signs were taken down. The messages and control stations were changed on a weekly basis, rotating among stations, and the results were quantified by how many

recyclables were put in the respective receptacle. The observation period occurred on the same day each week at the same time and lasted for ten weeks during spring quarter, 2012.

RESULTS

A preliminary survey asked students to rank the seven messages from most effective to least effective in their eyes (Figure1).

It was found that overwhelmingly the educational statement was rated to be the most effective in promoting recycling. The message ranked least effective in fostering positive environmental behavior was the negative descriptive and positive injunctive message. Based on the results of the survey, the following four messages and a control (no message) were used for the field portion of the study. Each message was displayed a total of four weeks throughout the study. The educational statement, expressed as "Fact" in figure 2, ranked most effective in the survey results, was:

Recycle because recycling:
- Reduces the need for landfills
- Protects wildlife habitats and biodiversity
- Reduces water use
- Reduces use of toxic chemicals
- Creates jobs and promotes economic development.

The second message, expressed as "DPU recycle" in figure 2, used a positive descriptive with a positive injunctive norm, which is theoretically predicted to be most effective, but in the experimental survey ranked in the middle in the results:

Many DePaul students recycle to help preserve our world. Help the world become a cleaner place and recycle.

The third message, expressed as "US trash, DPU recycle" in figure 2, included negative descriptive (for U.S.) with positive descriptive (for DePaul) and positive injunctive norms, which also ranked in the middle:

The U.S. is the #1 trash producing country. Many DePaul students recycle to help preserve our world. Help reduce the amount of trash and recycle.

This message is different from the positive injunctive with positive descriptive because it includes three different norms, instead of two, and adds a negative norm. The fourth and final message, expressed as "DPU trash" in figure 2, was a negative descriptive and positive injunctive norm, which ranked least effective in the survey results:

Many DePaul students do not participate in recycling, which hurts our natural world. Help the world become a cleaner place and recycle.

The amount of waste at each of the three receptacles differed, with one receptacle receiving nearly 60% more material than the others. For this reason the amount collected at each station was adjusted by the station average for the control treatments. While no significant differences between messages existed from the field study (Fig. 2), the educational statement accumulated the most recyclable material. This result corresponded to what was predicted by the preliminary surveys. The remaining three messages were lower than the control.

DISCUSSION

The educational message resulted in the most recycled materials, as predicted by the student's perceptions of what message would be effective, but counter to what social marketing predicted. The message that accumulated the least amount of recyclable material was the negative descriptive with positive injunctive, again, the message that was predicted to be least effective by the preliminary survey and expected not to be effective by social marketing theory. Interestingly, the three messages that were less effective than the educational message showed a lower collection rate than the control. This suggests that a negative message may cause adverse behavior and, in this case, an absence of a message may result in more environmentally friendly behavior.

In speculation the scholastic setting of the messages could create a more appealing environment for the educational statement. Students may look for the most direct and fact filled statement, which is fulfilled by the educational statement. The attractiveness of the statement could also be the way it was formatted with bullet points. The bullet points give students an efficient way to learn about recycling, which may be more appealing than sentence form. The positive injunctive with positive descriptive message, predicted by social marketing to be most successful, was slightly less successful than the control. Students may have not been drawn in to read the sign or the sign may not have been enlightening them with new information. An engaging statement may be more stimulating for students; so when common knowledge is in a message, it is not a motivating factor.

Further testing needs to be completed in order to determine if the factual statement is significantly more effective than messages that use injunctive and descriptive norms. Due to time limitations only ten weeks of data were collected, resulting in four collection periods for each message. In a future testing window, with three stations, only two messages should be used with a control. Testing two messages would increase the amount of collection periods for each message, increasing the strength of the statistics. The most interesting comparison would be the factual statement, predicted to be most effective by students and most effective in promoting change compared to the positive injunctive with positive descriptive statement predicted by social marketing theory to be most effective, but was slightly less effective than no message.

CONCLUSION

It is interesting that the students' prediction of the most effective message type, which runs counter to social marketing theory, did produce the most recycled material. However, the statistical power of the results was lessened due to the small amount of replicates completed for each message. A follow-up study with fewer messages will help reveal what type of message is most effective in promoting recycling behavior. The current study did not have enough data to be statistically strong. With fewer messages more replicates will be able to be completed for each message, contributing more data for a better statistical analysis. The strength of this study lies in the direct observations of environmental behavior. While it is still unclear which types of messages will be most successful in causing the greatest change in behavior, the gap between environmental awareness and behavior still exists. Studies that combine behavioral intention with real behavior will be most successful in identifying messages that can close this gap.

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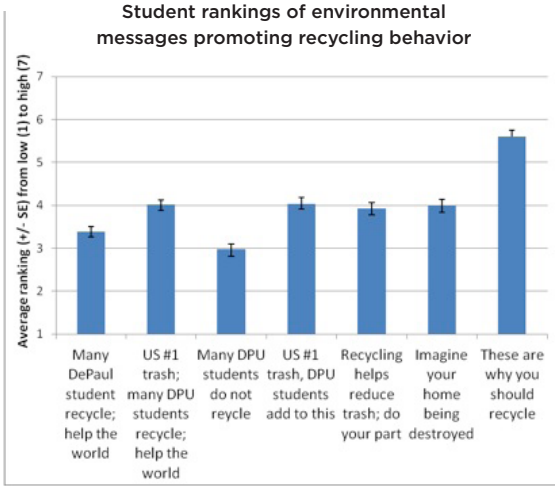

FIGURE 1

Seven messages were tested using a survey asking DePaul University students to rank the messages most effective to least effective in creating positive environmental behavior. On the vertical scale 7 is ranked as "most effective" and 1 is ranked as least effective.

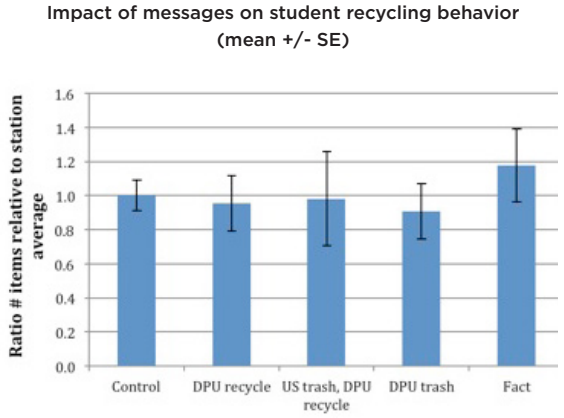

FIGURE 2

Four messages and a control were tested at DePaul's Lincoln Park cafeteria. The treatments are coded as DPU recycle (positive descriptive, positive injunctive), US track, DPU recycle (negative descriptive US, positive descriptive DePaul, positive injunctive), DPU trash (negative descriptive, positive injunctive) and Fact (educational statement). Values above 1 were more recyclables collected than the control, values below 1 represented fewer recyclables collected.